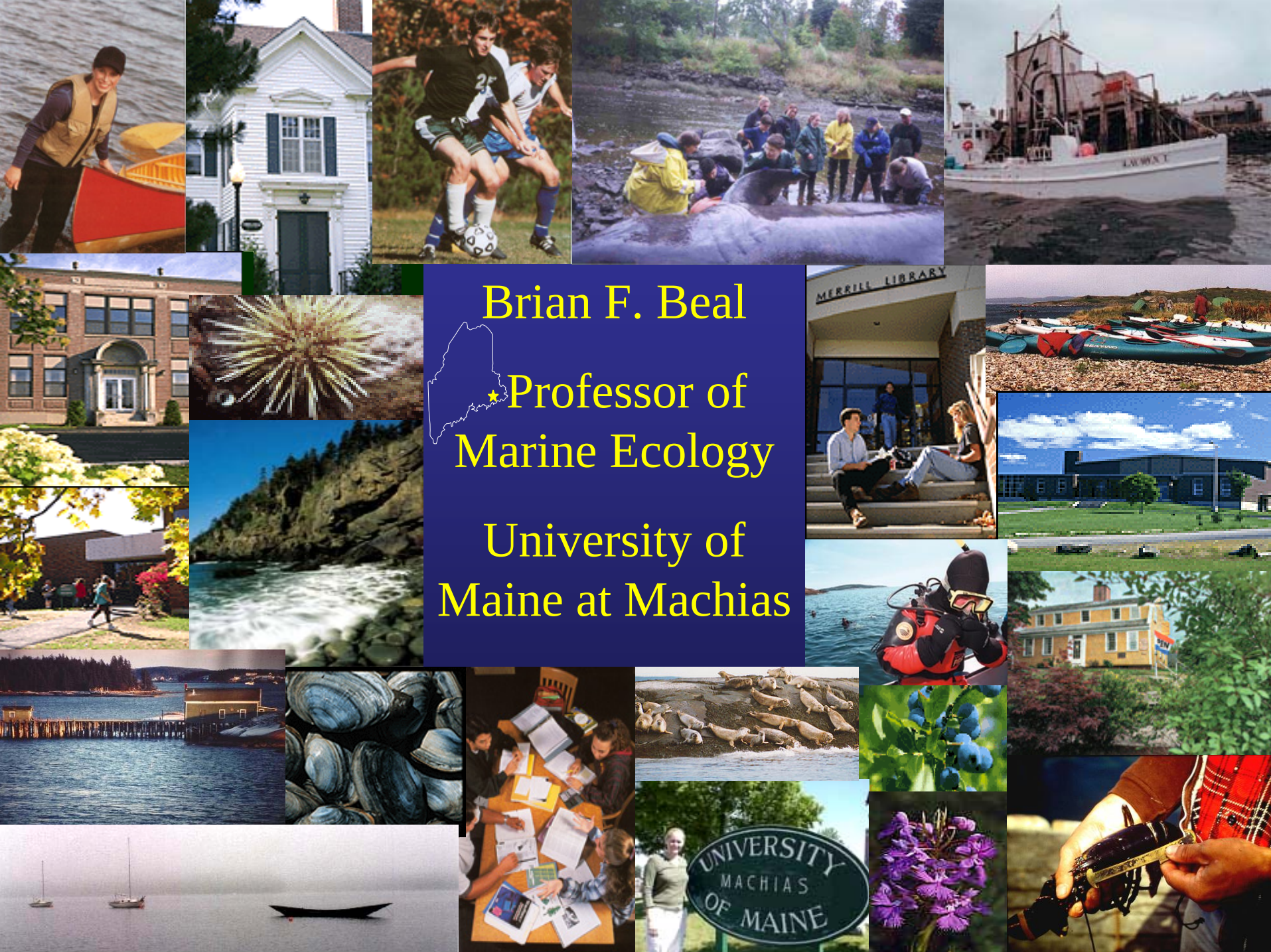
Brian F. Beal
Professor of
Marine Ecology
University of
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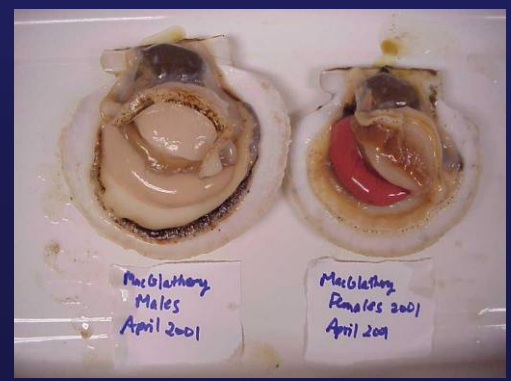
Assessing re-seeding efforts

Sea scallop restoration, or enhancement, efforts come in all shapes and sizes

I. Spat collectors

II. Transplanting hatchery-reared individuals

III. Spawner sanctuaries



How does one assess project success?

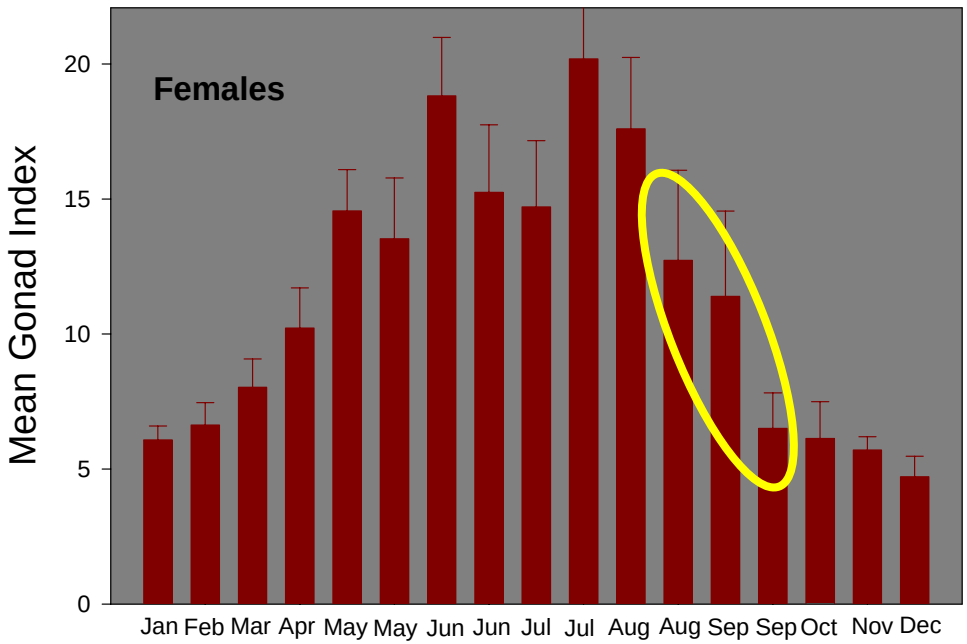
Scale

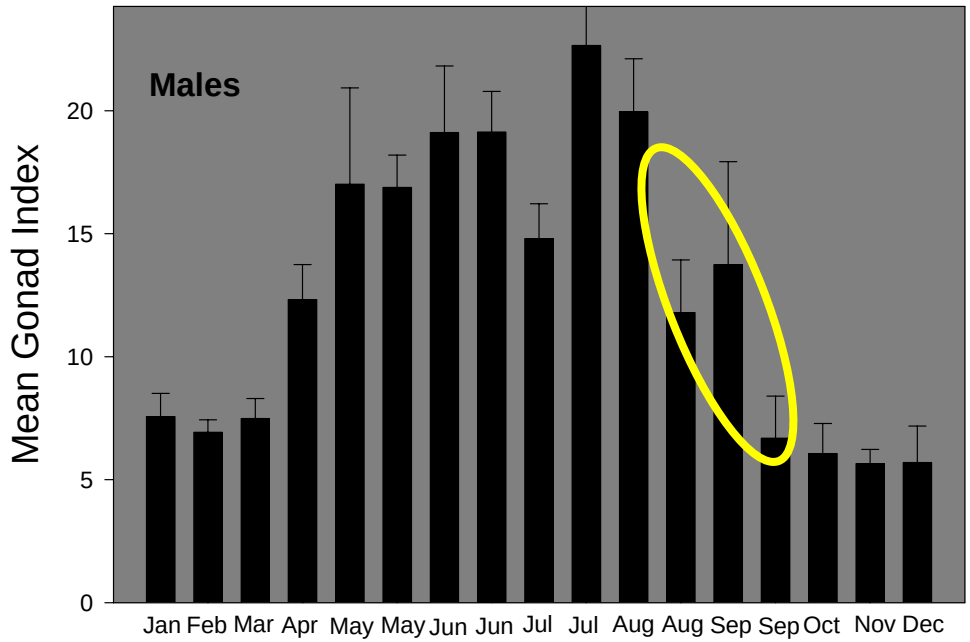
Large

Small

$$\text{Work} = \frac{M}{2} v_1^2$$

$$= \frac{Mr^2}{2} \left(\frac{1}{d(1+c)} \left[s_2 + cs_1 + \frac{d^2 b}{I} (s_2 - s_1) \right] \right)^2$$





In eastern Maine, scallops begin to spawn in mid- late August and continue through mid-September

- +97 individuals
- 400 volunteer hrs
- Tagged over 8,000

Volunteers included:

- Retirees & URI students
- Shellfishermen & Interns
- NOAA, RIDEM, EPA
- H. S. students & teachers
- Salt Pond citizens

Where Did +500,000 Scallop Seed Go? . . . . .

Locations	Seed (m^2)	Shell Frag. (%)
Beef Island	0.10	7.5
Central Channel	0.12	46
Thomas Point	0.05	22

"Ecosystem restoration is an activity at which everyone wins: when successful, we are rewarded by having returned a fragment of the earth's surface to its former state;

when we fail, we learn an immense amount about how the ecosystems work, provided we are able to determine why the failure occurred."

- John J. Ewel, Ecologist

Scenario I: Transplanting sea scallop seed

a. Identify those factors that contribute to scallop mortality?

Transplant site

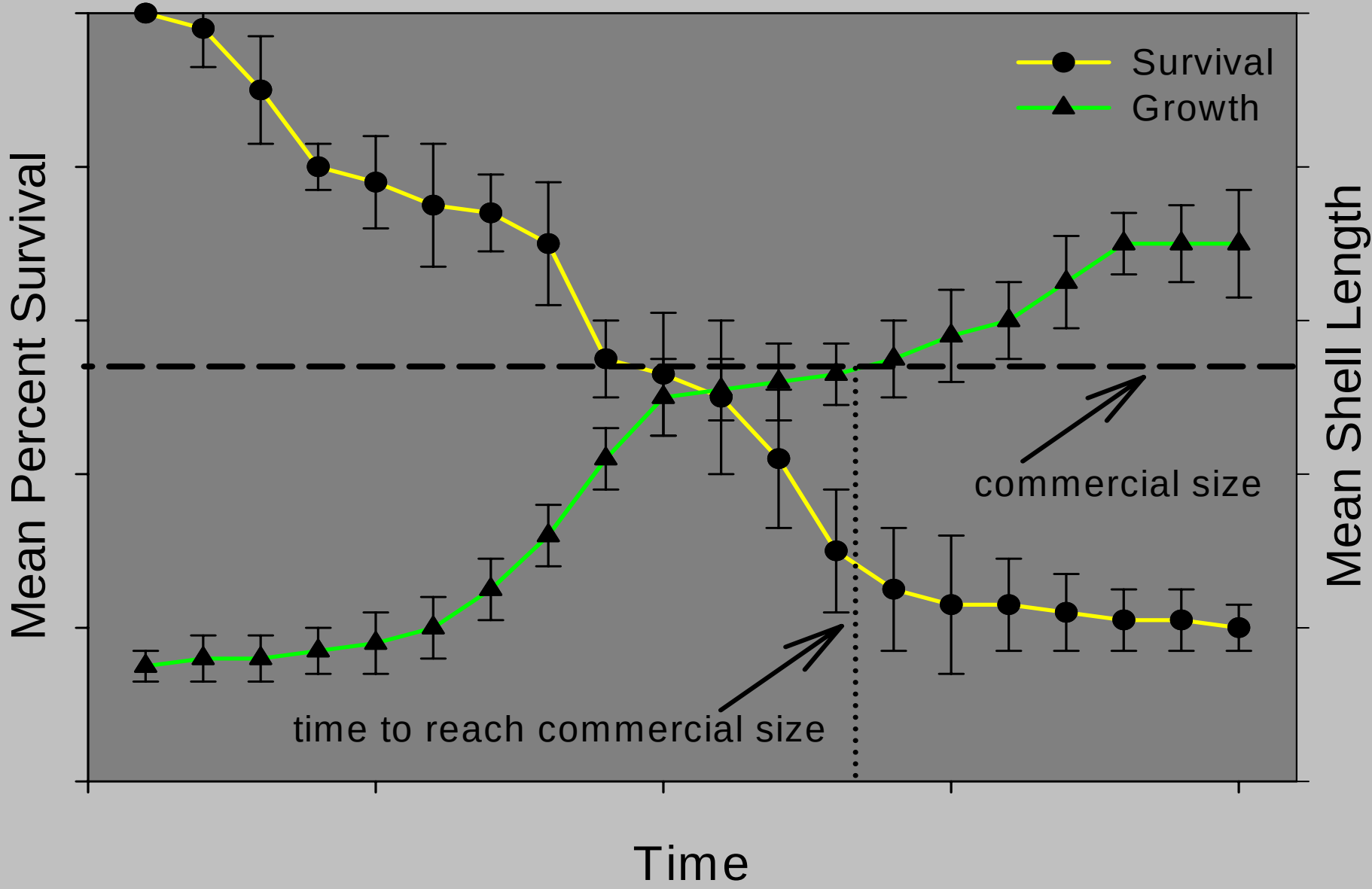
Transplant time of year

Stocking density

Initial scallop size

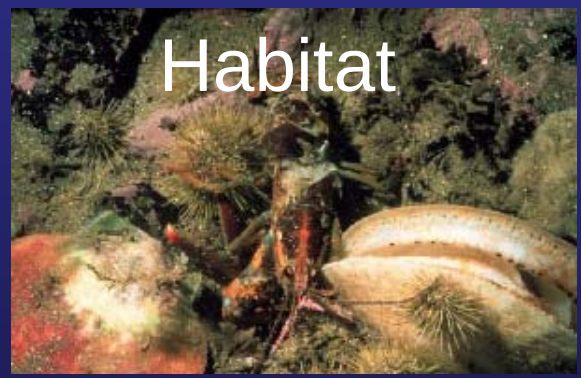
Predator type, size, abundance

Determine how important each potential source of mortality is using survival and growth as dependent variables



Transplant site

How ***representative*** is the site you have chosen with respect to the suite of other potential transplant sites in terms of:



How do you know?

Transplant time of year

To date, most sea scallops juveniles have been seeded in the spring at very small sizes

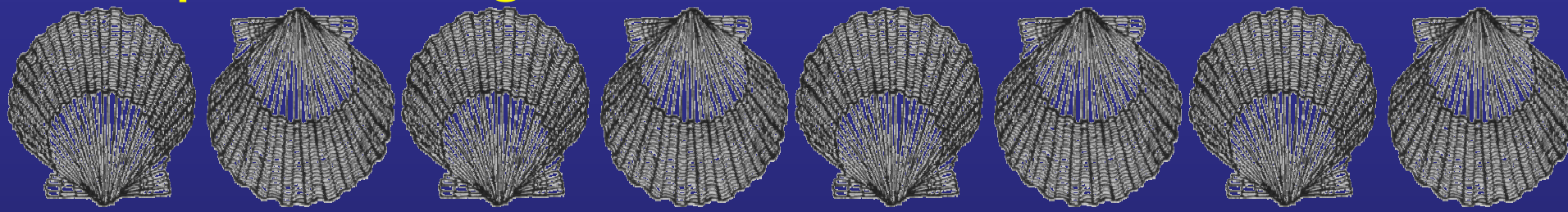
WHY? Because, this is the time of year…

1. that maximizes both growth and survival?
2. that is convenient?
3. when predators are not as voracious?
4. when sea scallops naturally settle and begin to grow?

Are these answers accurate?

Stocking density and transplant size

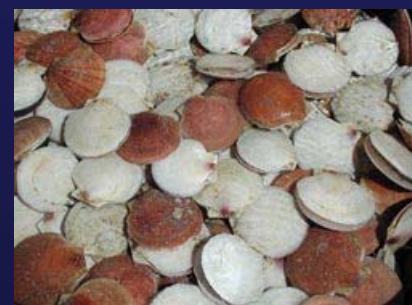
What stocking density and transplant size optimizes growth to commercial size?



Is this: site specific? size-specific?

Do these parameters change from one year to the next?

How do you know?



Predators

What predators attack what size seed?

When is predation heaviest?

Is it possible to reduce predator effectiveness or deter predation?

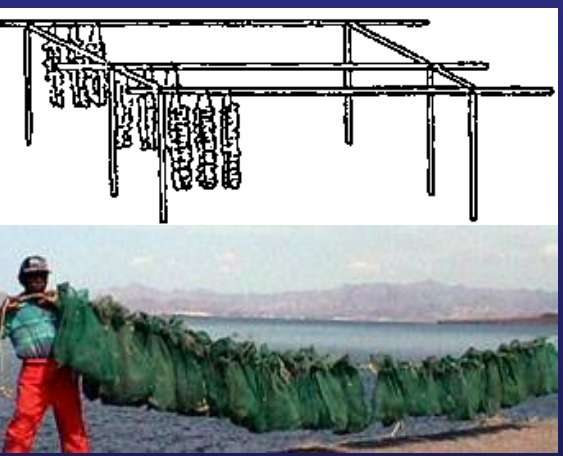
Can predators be trapped?

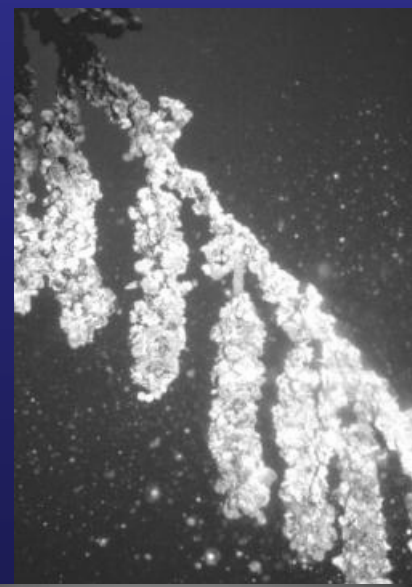
Are predators important?

How do you know?

¿ A larger question ?

How do we know that wild collection is the most effective method to obtain large numbers of sea scallop juveniles?





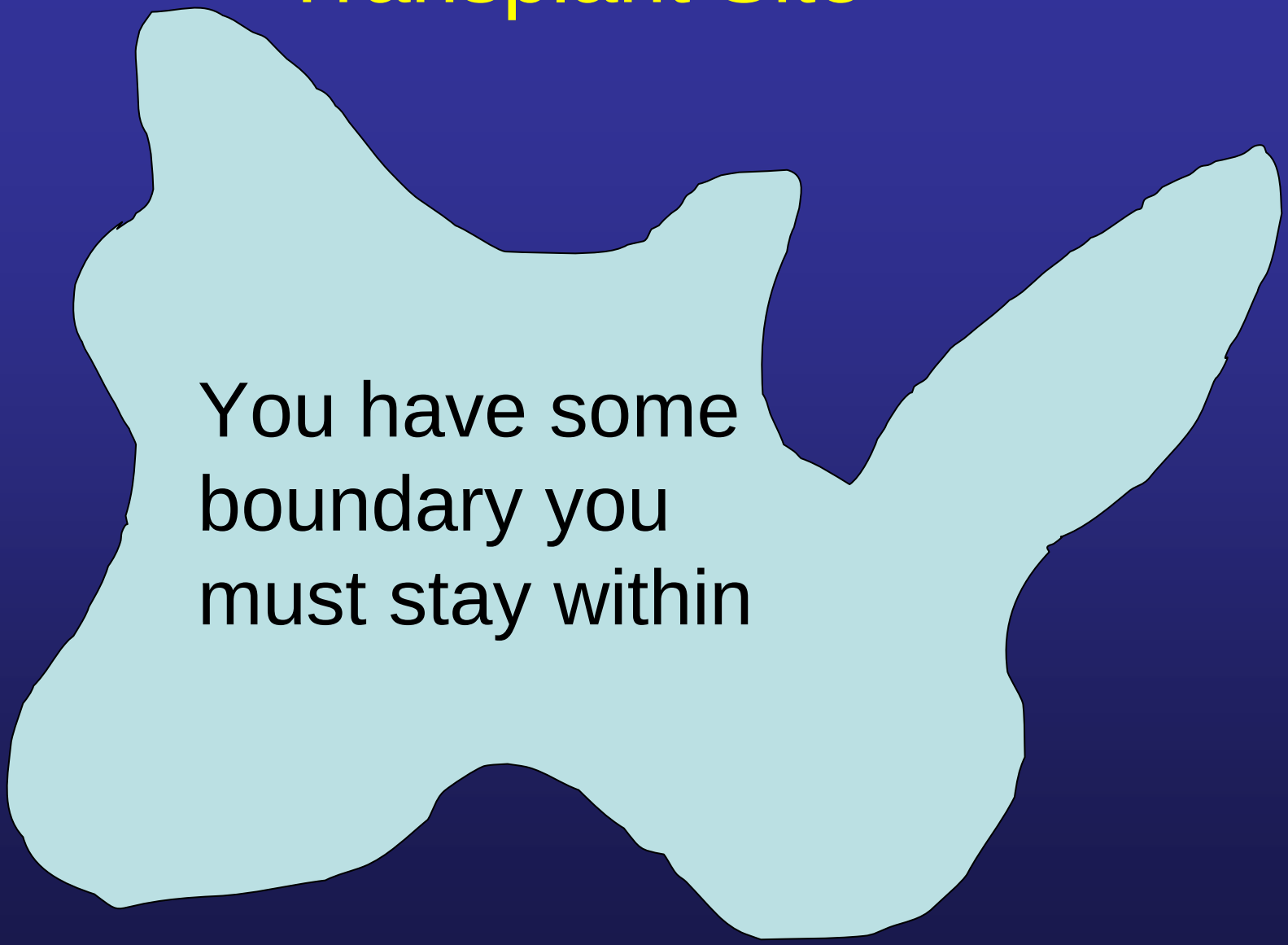
The Three Levels of Assessing Efficacy of Stock Enhancement Programs

1. "We seeded, so it was successful!"

2. Monitoring regularly or intermittently through time to follow the fate (growth/ survival) of a subset of seeded individuals.

3. Monitoring combined with determining the actual mechanisms (sources of mortality) and their overall importance.

Transplant Site



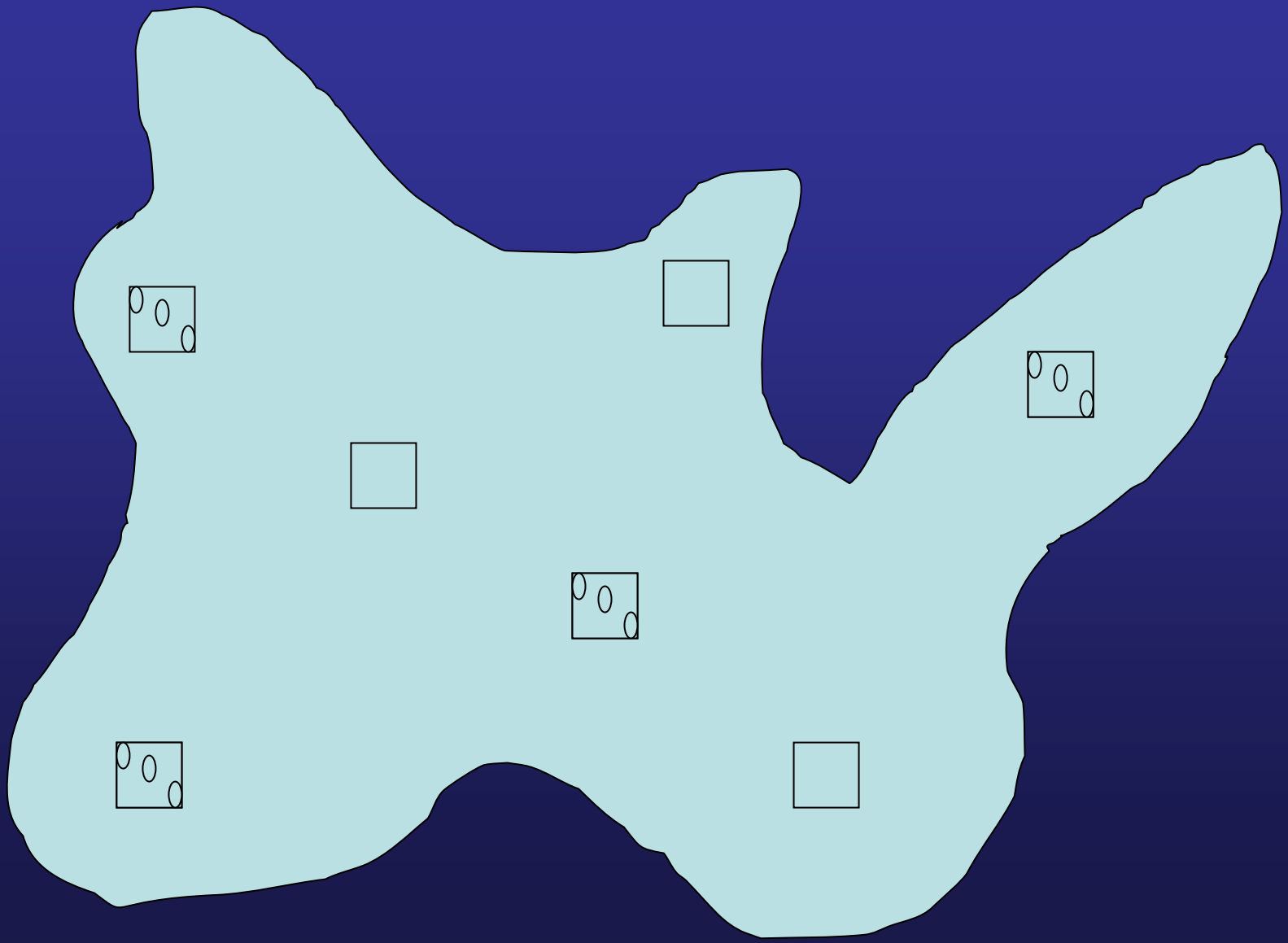
Transplant Site

0.25 km

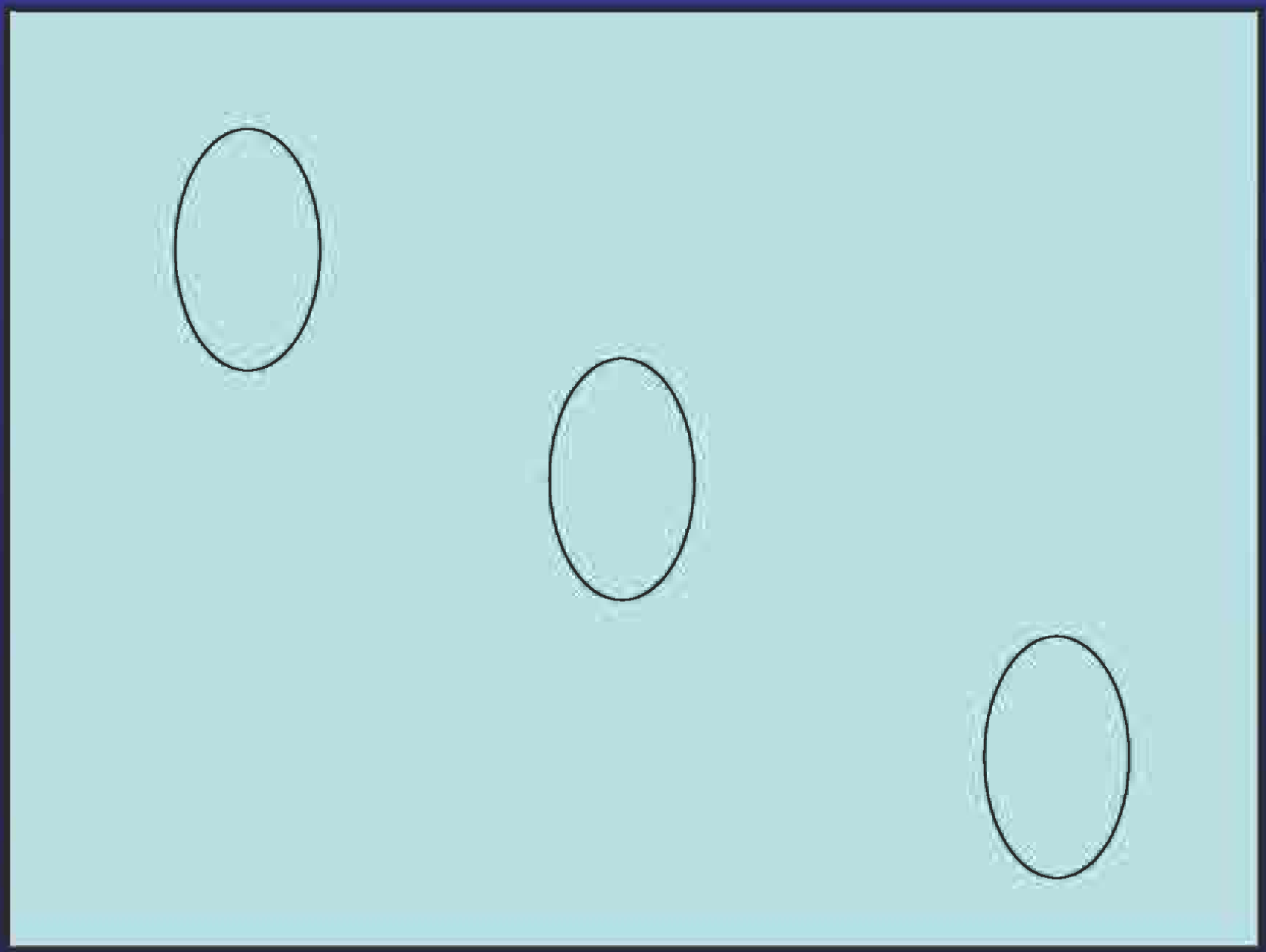
Enhancement Site

0.50 km

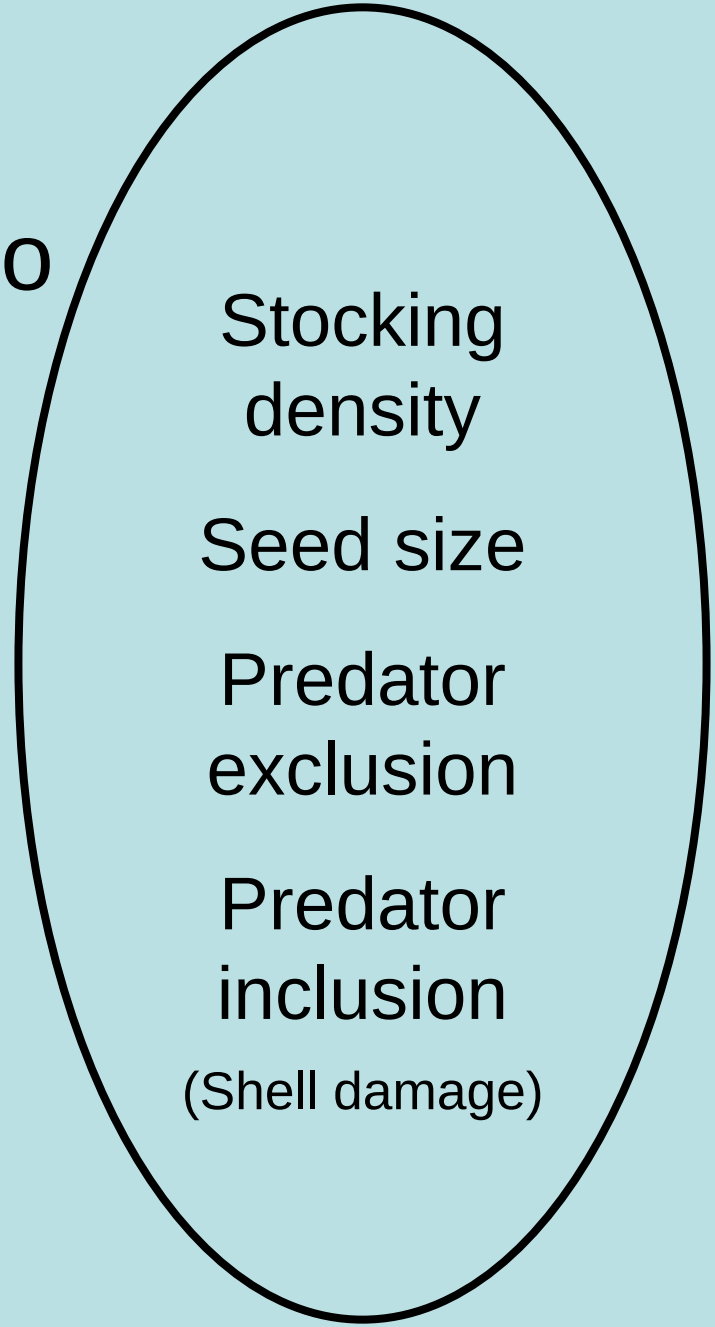
Multiple transplant sites



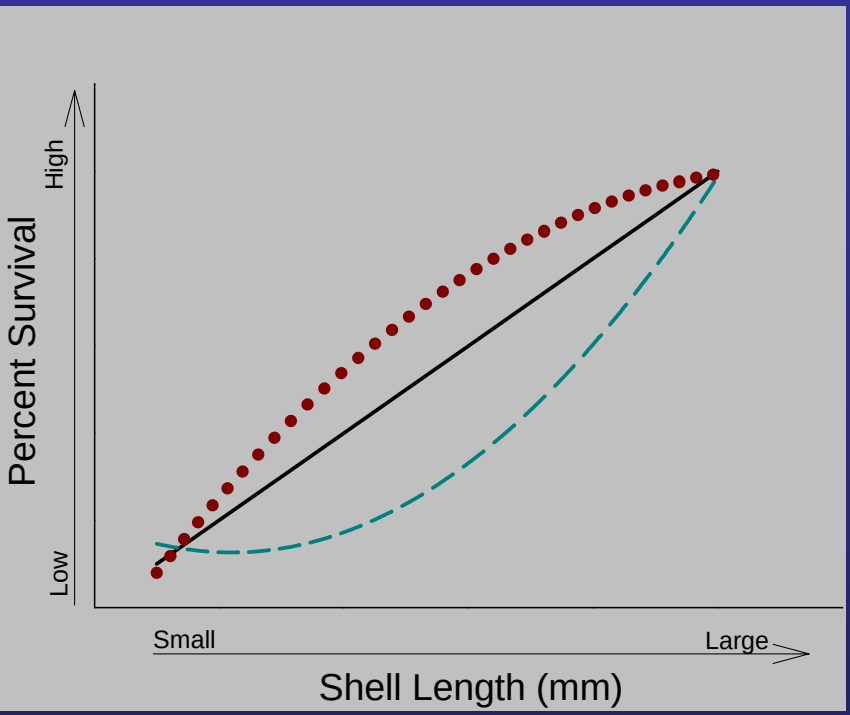
Representative

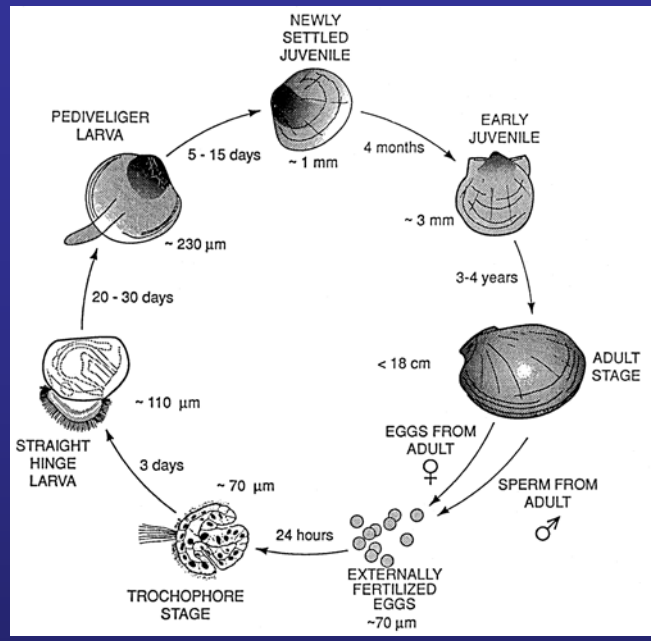


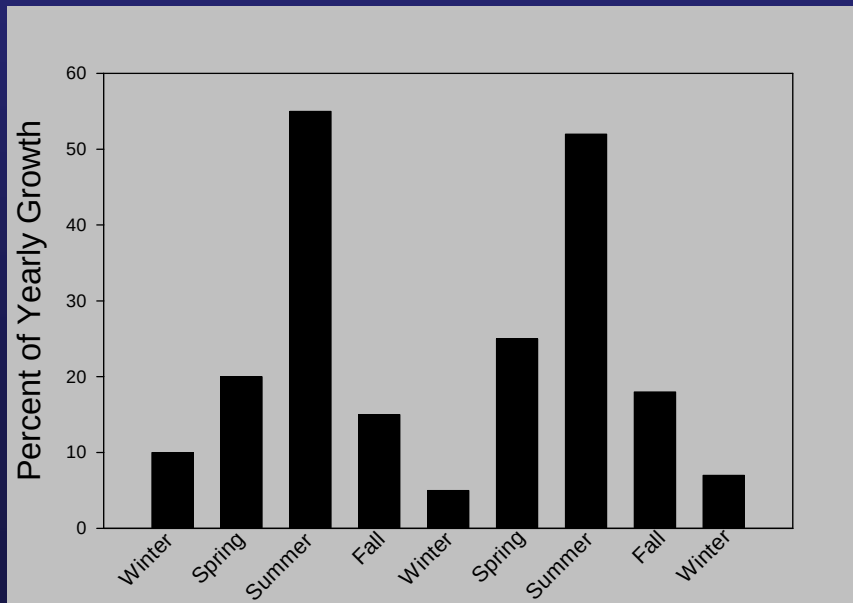
Manipulative Experiment to test effects of….



Transplant time of year







Possible Future Directions

Emphasis should be placed on assessing the best method of collecting the most wild sea scallops possible in terms of site, deployment times, water depth, materials used, amount of time collectors spend in the water, and the cost per effort to collect 1,000 individuals of size X

AND/OR

Developing husbandry methods to spawn adults, and to rear larvae and juveniles to a transplantable size, and assess the cost per effort to produce 1,000 individuals of size X

Only when we have determined the best method of collecting or producing sea scallops – that is, a method that is repeatable, predictable, and you can take to the bank, can we begin to assess the efficacy of our enhancement efforts.

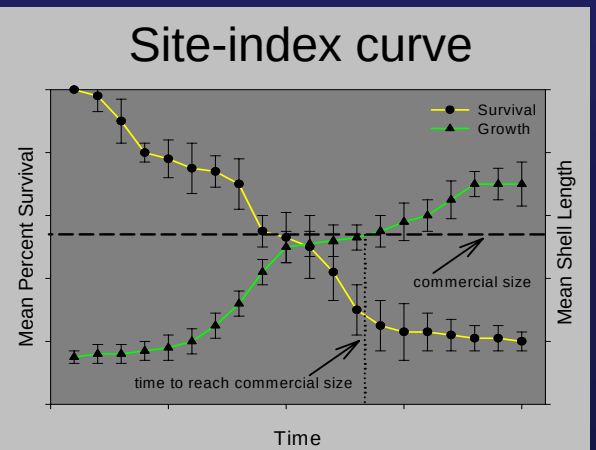
But, once we have made that determination

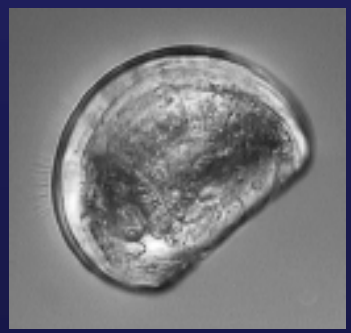
.....

We need to admit that here in Maine, we are not sophisticated in our understanding of how to enhance wild sea scallop stocks to know even if the scallops we collect at present actually live and grow to commercial size

Where do we begin?

We ask funders to invest in an applied research project that involves fishermen and scientists to look at a combination of factors that we know influence sea scallop survival and growth. These studies should examine how well scallop juveniles do when seeded at different sizes, times of year, and bottom sites. The studies should be designed to assess the fate and growth of individuals over a long enough time frame to allow the development of site-index curves






Thanks!